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(54) **Apparatus for temporarily immobilizing a local area of tissue**

(57) The invention is apparatus for performing beating heart surgery, in which a single articulating arm supports multiple suction pods. Once the suction pods are applied to the heart surface, tightening a cable fixes the arm in place. Then, the suction pods may be spread apart from each other to tighten the surface of the cardiac tissue lying between the suction pods. In one embodiment, fixation of the arm as well as the spreading apart of the suction pods may occur concurrently or almost concurrently through the tensioning of a single cable. Additional embodiments of the method, system and its components are shown.

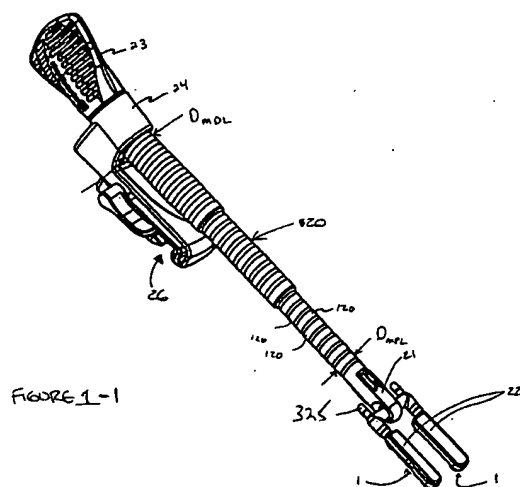


FIGURE 1-1



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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CL7)
X	EP 0 791 330 A (CARDIOTHORACIC) 27 August 1997 (1997-08-27)	1-11, 18-21, 45,46, 78,79, 82-88, 110, 114-118	A61B17/02
Y	* column 37; figures 108,30,42,65 *	63-67, 94,96	
A	* figures 33,75 *	29	
A	* figure 32C *	14	
X	* figure 32B *	12,57,58	
X	* figure 32C *	13,59	
	* figure 60 *		
X	* column 14, line 28 *	89,90	
A	* figures 18,44 *	93,99	
A	* figures 32,18 *	98	
X	* column 31, paragraph 2; figure 32 *	104-106	

X	DE 297 08 050 U (RIESS) 17 July 1997 (1997-07-17)	119,123, 124	TECHNICAL FIELDS SEARCHED (Int.CL7)
Y		94,96	
A	* figures 3,4,10 *	12-14	A61B

Y,D	US 5 727 569 A (BENETTI) 17 March 1998 (1998-03-17)	63-67	
	* figures 8,9 *		
A	* figure 7A *	80	

A	WO 98 10705 A (MINNESOTA SCIENTIFIC) 19 March 1998 (1998-03-19)	29,122	
	* abstract; figures 1,2,4 *		

A	WO 98 17182 A (GENZYME) 30 April 1998 (1998-04-30)	29	
	* page 15, last paragraph; figure 16 *		

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 April 2000	Examiner Barton, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



European Patent
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Application Number
EP 99 30 7331

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 7331

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
A	EP 0 808 606 A (USSC) 26 November 1997 (1997-11-26) * figures 41,42,50 * ---	90,93,99		
A	EP 0 167 345 A (MICRA) 8 January 1986 (1986-01-08) * page 7 * ---	92,93, 99,100		
A	US 3 786 815 A (ERICSON) 22 January 1974 (1974-01-22) * column 1, line 44 - column 2, line 15 * ---	91		
A	US 4 711 247 A (FISHMAN) 8 December 1987 (1987-12-08) * column 3, paragraph 2 * ---	107		
A	US 3 951 138 A (APOKOV) 20 April 1976 (1976-04-20) * abstract; figure 1 * ---	104,105		
A	US 5 749 892 A (VIERRA) 12 May 1998 (1998-05-12) ---			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	WO 98 27869 A (UNIVERSITY OF MASSACHUSETTS) 2 July 1998 (1998-07-02) ---			
D,A	WO 97 10753 A (MEDTRONIC) 27 March 1997 (1997-03-27) ---			
P,X	WO 99 16367 A (ALLIANCE) 8 April 1999 (1999-04-08) * page 5, line 6 - line 9; figures 1,7,12,13 * --- -/--	1,94-97, 119-121, 123		
The present search report has been drawn up for all claims				
Place of search THE HAGUE		Date of completion of the search 26 April 2000	Examiner Barton, S	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				

EPO FORM 1503.03.82 (P/C/C01)



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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 99 30 7331

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-11, 18-21, 45, 46, 78, 79, 82-88, 110, 114-118

Tissue immobilising system with movable paddles, in particular with a combination of malleable conforming and suction gripping

2. Claims: 1, 22-25

Tissue immobilising system with movable paddles, with spreading means including a spreadable saddle

3. Claims: 1, 29, 31-38

Tissue immobilising system with movable paddles, with independent spreading of first and second paddles

4. Claims: 1, 14-17, 39-44, 47-52

Tissue immobilising system with movable paddles, with hinged spreading means

5. Claims: 1, 53-56, 81

Tissue immobilising system with movable paddles, with simultaneous paddle spreading and arm locking

6. Claims: 1, 12, 20, 30, 57, 58

Tissue immobilising system with movable paddles, with parallel paddle spreading

7. Claims: 1, 13, 59-62

Tissue immobilising system with movable paddles, with non-parallel paddle spreading

8. Claims: 1, 63-77

Tissue immobilising system with movable paddles, with multiple suction ports on a single surface

9. Claims: 1, 80

Tissue immobilising system with movable paddles, with



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 7331

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P, X	EP 0 920 835 A (ETHICON) 9 June 1999 (1999-06-09) * paragraphs '0036!', '0040!; figures 12,13 * -----	1, 63	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 April 2000	Examiner Barton, S
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503.03.82 (PatC01)



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 99 30 7331

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

special arrangement of suction source, suction port and
paddle and port surfaces

10. Claims: 1,89-93,99-103

Tissue immobilising system with movable paddles, with
special construction of flexible arm

11. Claims: 1,26-28,94-98,110-113,119-126

Tissue immobilising system with movable paddles, with
spreading actuator remote from paddles

12. Claims: 1,104-109

Tissue immobilising system with movable paddles, with paddle
with puncturing and dispensing capability

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 7331

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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26-04-2000

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 791330	A	27-08-1997	US 5894843 A	20-04-1999
			AU 1480597 A	28-08-1997
			BR 9701028 A	03-11-1998
			CA 2197614 A	21-08-1997
			JP 10005230 A	13-01-1998
			NO 970753 A	21-08-1997
			US 6036641 A	14-03-2000
DE 29708050	U	17-07-1997	WO 9849947 A	12-11-1998
			EP 0981297 A	01-03-2000
US 5727569	A	17-03-1998	AU 1478797 A	28-08-1997
			BR 9701030 A	03-11-1998
			CA 2197608 A	21-08-1997
			EP 0791329 A	27-08-1997
			JP 11019096 A	26-01-1999
			NO 970751 A	21-08-1997
			US 5906607 A	25-05-1999
			US 6032672 A	07-03-2000
WO 9810705	A	19-03-1998	US 5899627 A	04-05-1999
			EP 0866673 A	30-09-1998
			JP 2000501323 T	08-02-2000
WO 9817182	A	30-04-1998	AU 4599697 A	15-05-1998
			EP 0944356 A	29-09-1999
EP 808606	A	26-11-1997	US 5967973 A	19-10-1999
			AU 1911497 A	30-10-1997
			CA 2202833 A	26-10-1997
			JP 10052430 A	24-02-1998
			AU 1911597 A	30-10-1997
			CA 2202838 A	26-10-1997
			EP 0803228 A	29-10-1997
			JP 10033543 A	10-02-1998
			US 5947896 A	07-09-1999
EP 167345	A	08-01-1986	GB 2166190 A	30-04-1986
			JP 61092306 A	10-05-1986
US 3786815	A	22-01-1974	NONE	
US 4711247	A	08-12-1987	AU 615161 B	26-09-1991
			AU 7356987 A	09-11-1987
			BR 8707670 A	15-08-1989
			CA 1306673 A	25-08-1992

EPO FORM P0459

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 7331

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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-04-2000

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4711247	A		DK 663887 A	16-12-1987
			EP 0303618 A	22-02-1989
			FI 884802 A	18-10-1988
			JP 1502718 T	21-09-1989
			WO 8706115 A	22-10-1987
			US 5605160 A	25-02-1997
			US 5588441 A	31-12-1996
			US 5027826 A	02-07-1991
			US 5154181 A	13-10-1992
			US 5735288 A	07-04-1998
			US 5335670 A	09-08-1994
US 3951138	A	20-04-1976	SU 449525 A	15-05-1976
			CA 1034825 A	18-07-1978
			CH 583545 A	14-01-1977
			DE 2434883 A	27-03-1975
			FR 2238463 A	21-02-1975
			GB 1457365 A	01-12-1976
			IT 1034067 B	10-09-1979
US 5749892	A	12-05-1998	US 6017304 A	25-01-2000
			US 5807243 A	15-09-1998
WO 9827869	A	02-07-1998	AU 5803798 A	17-07-1998
WO 9710753	A	27-03-1997	US 5836311 A	17-11-1998
			AU 7241496 A	09-04-1997
			BR 9610670 A	06-07-1999
			CA 2232580 A	27-03-1997
			CN 1198664 A	11-11-1998
			EP 0939605 A	08-09-1999
			JP 11511366 T	05-10-1999
			NO 981289 A	19-05-1998
			US 6015378 A	18-01-2000
			US 5927284 A	27-07-1999
WO 9916367	A	08-04-1999	AU 9664398 A	23-04-1999
EP 920835	A	09-06-1999	US 6007486 A	28-12-1999
			AU 8831798 A	29-04-1999
			CA 2249655 A	07-04-1999
			JP 11192226 A	21-07-1999

EPO FORM P0459

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